DESIGN REPORT
INSPECTION PLAN
OPERATION AND MAINTENANCE PLAN
AND
POST CONSTRUCTION MONITORING PLAN

Property of
Lake and River Enhancement Section
Division of Fish and Wildlife/IDNR
402 W. Washington Street, W-273
Indianapolis, IN 46204

PREPARED FOR

LOON LAKE PROPERTY OWNERS ASSOCIATION

DECEMBER, 1997

J. F. NEW & ASSOCIATES, INC.
Environmental Engineers/Biologists/Planners/Consultants
Walkerton/Indianapolis, Indiana

LOON LAKE ENHANCEMENT PROJECT
LOON PROPERTY OWNERS ASSOCIATION

DESIGN REPORT
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DESIGN REPORT

A. Location

Loon Lake is located approximately 9 miles north of Columbia City, Whitley and Noble County, Indiana. The proposed lake enhancement project occurs along Friskney Ditch, a main tributary of Loon Lake. Friskney Ditch conveys a significant portion of the flow for the Loon Lake watershed. The entire drainage area for the Friskney Ditch watershed covers approximately 3.2 sq miles.

The proposed lake enhancement project is located south of County Road 700 North and west of County Road 200 West. The site location can be found in the NW 1/4 of Section 6, Township 32N, Range 9E as found on the Ormas, Indiana Quadrangle Map.

B. Project Objective

The Loon Lake Property Owners Association has proposed an enhancement system to improve the quality of water entering Loon Lake. The present land use for the contributing watershed is primarily agricultural. The profile of Friskney Ditch has a minimal grade to the discharge into Loon Lake. The enhancement system, consisting of constructing a series of sedimentation basins and constructed wetlands along Friskney Ditch, is necessary to reduce the amount of nutrient and sediment loading occurring in the lake.

The concept behind retaining water in a constructed wetlands or sedimentation basin is to reduce the suspension and transportation energy of moving waters. Water in motion has the capacity to scour and transport fine sediments (silts and clays) long distances before deposition. While a sedimentation basin that has inflow and outflow cannot hold water motionless, the energy can be reduced sufficiently to facilitate the fallout of sediment from the water column. Additionally, the constructed wetlands will remove nutrients from runoff through uptake by wetland plant species and bacteria they support.

The following factors were considered for optimal sedimentation basins and constructed wetlands design:

- Significantly reduce the horizontal velocity of the water column.
- Reduce velocities of the inflow water as it enters the basins. Encourage laminar flow, rather than turbulent, channelized flow.
- Encourage the uniform distribution of flow throughout the entire volume of the constructed wetlands.
- Maximize contact of water with the substrate and vegetation in the wetland systems to facilitate efficient nutrient uptake.

- Structural stability and longevity. Resistance to hydraulic stress and erosive scour.

- Reduction of operation and maintenance costs.

- Maximize safety of the system operation, maintenance, and monitoring personnel and the general public.

- Optimizing the sites for wildlife habitat suitability.

- Minimize construction costs.

C. General Project Description

The project involves constructing a series of sediment basins and constructed wetlands along Friskney Ditch near the outlet of the watershed to trap sediments and nutrients prior to entering Loon Lake. This will create 0.7 acres of deeper water for submergent vegetation and 1.3 acres of wetlands with emergent vegetation. The deeper area will function as a sedimentation basin and the wetland area for filtration of sediment and removal of nutrients.

Using a series of smaller sedimentation basins and constructed wetlands has the following advantages. The first sedimentation basin traps the majority of the suspended solids and the first constructed wetlands removes a large portion of the nutrients. Any sediment and nutrients which pass through the first set are then trapped in the next set of sedimentation basin/constructed wetlands. The smaller size provides easier maintenance and lower construction costs.

D. Hydrology And Hydraulics

The legal lake level for Loon Lake in Whitley County is 895.14 MSL. The elevation of a drainage tile into Friskney Ditch 3,500 ft upstream of Loon Lake is 895.7 MSL. The minimal difference in elevation prevents any back-up of water in Friskney Ditch. For this reason, the sedimentation basins and constructed wetlands were designed to spread the water horizontally and slow it down through widened channels; not by impeding the water's flow.

The wetlands contain several baffles within the channel area. These baffles force the water to take a longer path through the wetlands area and therefore remain in contact with the wetlands longer. Efficient treatment depends on the detention time of the wetlands and the baffles help to ensure detention time.

E. Environmental Concerns

1. Wetlands

Jurisdictional wetlands have been identified adjacent to the project. These wetlands lie to the east of the sediment basins/constructed wetlands. These wetlands, if disturbed during construction, are less than 1/3 of an acre and within headwaters of Friskney Ditch and

therefore qualify for a Nation Wide Permit.

2. Threatened or Endangered Species

According to the Indiana Department of Natural Resources, no threatened or endangered species of plants or animals are known to exist in the proposed project locations.

A letter was sent out to which the Indiana Department of Natural Resources has 30 days to respond regarding threatened or endangered species. The lack of a response was indication of no known threatened or endangered species of plants or animals in the proposed project locations.

3. Operations and Maintenance Activities

The future operations and maintenance dredging of the sedimentation basins may cause temporary damage to the aquatic benthic (ditch bottom) community. However, several studies done on dredging projects, indicate the negative impacts are short lived. Sediment escaping a basin will be settled out in the wetlands or downstream basin.

F. Land Rights

The owners of the property are Mr. David Curtis and Mrs. Martha Wolfe, Association members. The property rights for the construction and long term operation of the designed structures shall be as easements with ownership to remain with current owners.

G. Engineer's Estimated Costs For The Project Construction Phase

Table No. I - 1 provides cost estimates for both the construction portion and the engineering and inspection services to be provided during the project construction phase.

TABLE NO. I-1
CONSTRUCTION PHASE COST ESTIMATES

Line Item		Quantity	Unit Cost	Total Cost
1)	Excavation	16,023 CY	$2.50	$40,057.50
2)	On-Site Spoil Disposal	15,879 CY	$1.50	$23,818.50
3)	Compacted Backfill	144 CY	$2.00	$288.00
4)	Erosion Control	1 LS	$7,186.00	$7,186.00
5)	Clearing and Grubbing	1.6 Acre	$820.00	$1,312.00
6)	Riprap	164 CY	$30.00	$4,920.00
7)	Seeding and Planting	1 LS	$6,614.00	$6,614.00

8)	Mobilization		5%	$4,209.80
9)	Contingency		10%	$8,840.58
Total Construction Cost				$97,246.38
10)	Construction Engineering	1 LS	$2,000.00	$2,000.00
11)	Inspection (Part-Time for 5 Days)	1 LS	$2,000.00	$2,000.00
12)	Administration	1 LS	$1,000.00	$1,000.00
Total Construction Phase Costs				$102,246.38

SECTION II

INSPECTION PLAN

A. Overall Description Of Project

1. Description

Loon Lake is located approximately 9 miles north of Columbia City, Whitley and Noble County, Indiana. The proposed lake enhancement project occurs along Friskney Ditch, a main tributary of Loon Lake. Friskney Ditch conveys a significant portion of the flow for the Loon Lake watershed. The entire drainage area for the Friskney Ditch watershed covers approximately 3.2 sq miles. The present land use for the contributing watershed is primarily agricultural. The profile of Friskney Ditch has a minimal grade to the discharge into Loon Lake.

The enhancement system, consisting of constructing a series of sedimentation basins and constructed wetlands along Friskney Ditch, is necessary to reduce the amount of nutrient and sediment loading occurring in the lake. This will create 0.7 acres of deeper water for submergent vegetation and 1.3 acres of wetlands with emergent vegetation. The deeper area will function as a sedimentation basin and the wetland area for the removal of nutrients.

2. Authority and Duties of the Inspector

The authority and duties of the Inspector, also known as the Resident Project Representative, is clearly defined in Article 9.13 of the General Conditions and the Supplementary Conditions in the Contractor's Project Manual (also known as the Specifications).

B. Items Of Work To Be Inspected

The overall responsibility of the Inspector is to ensure the Contractor complies with the requirements of the Project Drawings and Specifications (Contract Documents). Specifically, that the materials furnished and the work installed meet the intent of the Project Drawings and Specifications.

The primary items of work to be inspected include the following items:

1. Wetlands and Basin Construction

- Verify Contractor's layout of slopes is correct.
- Ensure Contractor provides the specified compaction testing as the project is being constructed.
- Verify that the Contractor is following proper erosion control procedures during construction.

- Confirm that the project is properly seeded after construction.

- Verify the Contractor is conducting soil density testing in accordance with the requirements listed in the Project Manual.

2. Riprap

- Verify the riprap is the proper material and is installed were shown on the Drawings and in accordance with the Drawings and Specifications.

3. Erosion Control

- Temporary and final erosion control measures as required by Specification Section 02250.

- Filter fabric and erosion control blankets are installed where shown on the Drawings.

- All areas disturbed by construction activities have been planted in accordance with Specification Sections 02820 through 02870.

4. Other Items

- If damaged, all road surfaces used for equipment and machinery access are restored to original condition.

- Prior to final completion, the Contractor has adequately cleaned up the construction site in accordance with Specification Section 01710.

The inspection of the above items may be on an intermittent basis. However, the Lake Association may want portions of the construction inspected on a continuous basis to insure compliance with the Contract Documents.

C. Project Layout And Staking

The Contractor, not the Inspector, is responsible for the correct layout and staking of the project. However, the following information is provided to the Inspector for guidance and advice in the event the Contractor should need it.

Horizontal and Vertical Layouts South of C.R. 700 N. and West of C.R. 200 W.

Both the horizontal and vertical positions of the sediment basins and constructed wetlands are based on a pk nail at the intersection of C.R. 700 N. and west of C.R. 200 W. The elevation of this benchmark is 901 M.S.L.

D. Maintenance And Development Of Record Drawings

It is the responsibility of the Contractor to develop and maintain Record "as-built" Drawings for the project. However, the Inspector should maintain his own set in clear readable order on the project site for the inspection by any interested party.

In accordance with Specification Section 01720. The Contractor shall keep 1 copy of all Project Specifications, Drawings, addenda, modifications, supplemental drawings, shop drawings and change orders at the project site in good order and annotated to show all changes made during the construction process. In addition, the Contractor shall develop 3 sets of "as-builts" for the project.

The Record Drawings shall show all final elevations and dimensions, sizes and depths for structures, and all other information as necessary to constitute as-built records. These documents shall be kept daily by the Contractor and be made available to the Inspector and routinely checked by the Inspector for completeness and accuracy based on the Inspector's daily records and notes. It will be the Contractor's responsibility to furnish any and all information lost due to the Inspector's loss of these Record Drawings. In addition to other Contract requirements, retainage will be partially based on the Contractor's and Inspector's ability to maintain good as-built records, as determined by the Owner. Upon completion of the project, these Record "as-built" Drawings together with any other annotated supplemental plans, drawings, sketches, etc. shall be delivered to the Engineer for his final review and approval. If approved, the documents will be delivered to the Owner for the Owner's record. If disapproved, they will be returned to the Contractor for corrections, as necessary.

E. List Of Inspector's Equipment

All persons providing construction inspection services shall have available the following minimum list of equipment:

- 25 ft fiberglass or steel measuring tape.
- Notebook and/or daily inspection forms for recording Contractor's activities and progress. See **Appendix A**.
- Hand-held calculator.
- A 2 ft (minimum) level.
- 2 sets of Drawings and Specifications, 1 set designated for recording as-built information.
- Access to a surveying level, tripod and measurement rod in good working condition. Typically this can be supplied by the Contractor.

F. Recommended Qualifications Of Inspectors

The inspector shall have the following minimum qualifications:

- Previous experience in inspecting civil engineering projects, in particular, the construction of soil embankments.

- Experience in the establishment of vertical and horizontal control or access to a qualified surveyor.

- Experience in the inspection and/or installation of erosion control materials.

- Above all, the Inspector must be completely familiar with the requirements of the Contract Documents.

SECTION III

OPERATION AND MAINTENANCE PLAN

A. Description Of Operational Procedures And Maintenance Activities

The following are recommended methods and strategies for operating and maintaining the constructed wetlands and sedimentation basins designed for the Loon Lake Enhancement Project. The constructed wetlands and sedimentation basins have been designed to require minimum operator attention and minimize long term maintenance.

1. Operational Procedures

There are no operational procedures associated with this project.

2. Maintenance Activities

The primary maintenance activity to be performed is the periodic removal of accumulated sediment from the sedimentation basins.

There are two locations along the project where sediment can accumulate. The first is the initial sedimentation basin at the upstream end of the project. The second location is the second sedimentation basin located between the two constructed wetlands.

B. Projected Maintenance Schedule

1. Timing of Periodic Removal of Sediment from Basins

To prevent the possibility of resuspension of sediment, it is recommended that a sedimentation basin have the trapped sediment removed when the basin has lost **75%** of its design volume.

The estimated frequency of periodic maintenance is based on statistical modeling calculations of when the sediment control basins will lose 75% of their designed volume from trapped sediments. These models were developed by the USDA Soil Conservation Service (SCS) based on empirical data from experimental sedimentation basins.

Various assumptions on variable conditions in the Loon Lake watershed had to be made to estimate the sediment removal frequency. The sediment removal frequency and the assumptions used in the sedimentation rate calculations are provided in **Appendix B.**

Sedimentation Basin No. 1 is projected to be 75% filled with sediment after 2.1 years and Sedimentation Basin No. 2 after 3.3 years. All estimated values represent existing conditions. The frequency can be reduced by the implementation of upstream watershed improvements. However, the use of existing conditions as a conservative "worst expected case" condition allows the Association to plan manpower and budget conservatively. The actual time it takes for the basins to become 75% percent full of sediment may be different. However, for project

planning and budgeting purposes it is recommended that the Lake Association use the Engineer's projected periodic maintenance estimate.

2. Sediment Removal Methods

There are three main methods of sediment removal, hydraulic dredging, drag-line dredging, and land based excavating with earth moving equipment. Any of which will remove the sediment. Due to the relatively small size of the basins, the use of land based equipment would be the most probable method. The Engineer suggests that the Association solicit bids from qualified contractors to perform the sediment removal and let the bidding process dictate which is the most efficient method to use. Have the contractor submit a plan of operation, detailing the specifics of their proposed operation, with their bid to perform the sediment removal and disposal.

C. Disposal Of Dredged Spoil

1. Permitting for Dredging and Disposal of Spoil

Dredging operations will require a permit from the U.S. Army Corps of Engineers, since Friskney Ditch is considered to be waters of the United States' under the Clean Water Act. This permit is required even when dredge spoil is disposed of on an upland site.

A permit should not be required from the Indiana Department of Environmental Management (IDEM) for land disposal of dredge spoil. Most ditch sediments in rural areas have relatively low concentrations of substances regulated as hazardous waste. Therefore, the material can be disposed of in almost any upland site without acquiring an IDEM permit.

2. Disposal of Dredge Spoils

The availability and identification of disposal sites may ultimately dictate the method of dredging that will be required. Preferably, sediments should be disposed outside the watershed, or at least in an application protected from erosion and transport back into the lake.

If hydraulic dredging is used, the method of disposal for dredged sediments involves the construction of a temporary diked basin on an upland site to store the slurry. The temporary basin has a sluice gate with a pipe to dewater the basin after the sediments have settled out of the water column. The dewatering outlet can either be a pipe delivering water back to the ditch or the water can be discharged on the ground surface and allowed to drain back into the ditch via overland flow. Overland return flow has two advantages over piped return flow:

- Overland return flow allowed to drain over vegetated land is further filtered of sediments prior to its discharge back into Friskney Ditch.

- The discharge of return flows from a point source (pipe outfall) may require a temporary NPDES permit to discharge from the IDEM. There could be strict

suspended solids limits in such a permit that would require more expensive treatment of the return water. This could involve either applying a flocculent to the basin to precipitate (coagulate and settle) sediments from the basin water column, or sizing the basin and timing the operation of the dredge such that the water is allowed longer residence time in the basin for increased sediment fallout. Increased basin sizing could make a temporary basin difficult to site and require a much longer pumping distance. However, if piped flow is necessary, measures will need to be taken to secure a NPDES permit.

Potentially, the dewatered material removed from the lake will be in high demand locally as topsoil or a soil amendment by persons capable of self hauling. Sediment testing will be required if dredged sediments are used as topsoil or other types of soil amendments.

The disposal of dredged material can account for over half of the total cost of sediment removal operations. One option would be to leave the dredge spoil piled at an accessible site available to self-haulers for a giveaway program. The other option would be to have the contract documents require that the contractor is responsible for removal and disposal of all spoil.

D. Estimated 0 & M Costs Per Year

Comparing costs are very difficult because of the highly variable disposal conditions that may be available. For example, the cost of siting and constructing a dewatering facility for hydraulically dredged sediments plus any cost in removing the material after dewatering (if a give away program is not implemented) may be more or less expensive than loading, transporting, and disposing of sediments dredged via earth moving equipment or drag-lining. These costs are highly variable from contractor to contractor.

It is recommended that the Association advertise for bids from qualified, responsible contractors without specifying the precise type of equipment to be used. The bid documents may specify that the contractor is responsible for obtaining disposal sites and arranging the timing and operation of the sediment removal.

It is recommended that the Loon Lake Property Owners Association retain an engineer/consultant to assist in the disposal site selection, obtain permits, and to develop the contract documents and specifications for the sediment removal operation.

Tables No. III-1 and III-2 present preliminary cost estimates for removing and disposing of sediment from each of the basins. The estimates are on a dry weight basis and based upon using land based earth moving equipment and on-site disposal.

The estimated cost for Sedimentation Basin No. 1 is $16,871. If the basin is dredged every 2.1 years, the cost per year would be $8,034 per year, in 1997 dollars.

The estimated cost for Sedimentation Basin No. 2 is $9,282. If the basin is dredged every 3.3 years, the cost per year would be $2,813 per year, in 1997 dollars.

TABLE NO. III-1
SEDIMENT REMOVAL AND DISPOSAL COST ESTIMATE
SEDIMENTATION BASIN NO. 1
FRISKNEY DITCH

Activity	Quantity	Unit Cost	Total Cost
Equipment Mobilization	1 LS	$803.40	$803.40
Sediment Removal	4,017 CY	$2.50	$10,042.50
Sediment Disposal	4,017 CY	$1.50	$6,025.50
Total Cost			$16,871.40

TABLE NO. III-2
SEDIMENT REMOVAL AND DISPOSAL COST ESTIMATE
SEDIMENTATION BASIN NO. 2
FRISKNEY DITCH

Activity	Quantity	Unit Cost	Total Cost
Equipment Mobilization	1 LS	$442.00	$442.00
Sediment Removal	2,210 CY	$2.50	$5,525.00
Sediment Disposal	2,210 CY	$1.50	$3,315.00
Total Cost			$9,282.00

SECTION IV

POST CONSTRUCTION MONITORING PLAN

A. General

The post construction monitoring program for the Loon Lake Enhancement Project involves monitoring the effectiveness of the constructed wetlands and sedimentation basins.

The post construction monitoring program should be integrated with the operation and maintenance activities discussed in **Section III.**

The following monitoring plan centers on monitoring the effectiveness of the constructed wetlands and sediment basins in removing suspended sediments and nutrients in Friskney Ditch. A secondary component of the monitoring plan is to monitor the succession of the wetland system.

A plan to monitor the success of lake enhancement projects must contain four key elements:

- Qualified personnel to perform the monitoring.
- Clearly defined monitoring objectives with a specific set of monitoring parameters.
- A monitoring schedule.
- A reporting format.

B. Qualified Personnel

Personnel monitoring the success of the wetlands and sedimentation basins after construction is complete should have the following qualifications:

- General knowledge of wetlands and wetland ecological functions.
- Familiarity with the design objectives to be achieved by the constructed wetlands and sedimentation basins.
- Familiarity with identification of wetland plant species, herbaceous vegetation, shrubs and trees.
- General familiarity with the watershed and soil types.

C. Monitoring Objectives And Recommended Inspection Parameters

The purpose of this monitoring program is to verify the constructed wetlands and sedimentation basins are performing the water quality improvement functions they were

designed to provide. In order to monitor the effectiveness, a set of monitoring parameters must be defined. In general the monitoring would involve visual inspection and chemical testing.

1. Visual Inspection

The visual inspection component of the monitoring program will involve three main parts.

- Inspection of the structural integrity of side slopes and banks within the sedimentation basins and the constructed wetlands.

- Inspection and assessment of the vegetative community in the constructed wetlands and sedimentation basins.

- Determination of the siltation rate in Friskney Ditch during rainfall events.

For the constructed wetlands and the sedimentation basins, a visual inspection of the **structural integrity** will be necessary. The project area will need to be inspected for the following:

- Human activity and vandalism such as riding horses and off-road vehicles along banks.

- Erosion of banks along project site.

Illegal activity impairing the performance or integrity of the project site should be promptly reported to the Whitley County Sheriff or conservation law enforcement personnel.

The constructed wetlands will need to be inspected to **assess the vegetative community** which is an important indicator of its health and therefore its efficiency in removing nutrients. Inspections should include the identification and quantification of the following plant classifications:

- Wetland plant species.

- Herbaceous cover.

- Shrubs (woody plants less than 4" diameter).

- Trees.

As the constructed wetlands system matures, a succession of the vegetation community is expected.

Both quantitative and qualitative information must be recorded to measure the maturation of the constructed wetlands. A site map from the Drawings can be used as a base map for

recording the location and quantities of the vegetative communities. A photographic record can be extremely valuable for documenting the progression of the wetlands development.

Finally, both the sedimentation basins and constructed wetlands should be monitored to **determine the amount of silt build-up**. The depth of water during normal flow can be determined and compared to previous measurements using a simple measuring stick. The depth of new silt should approximately be the difference between the depths of water. The depth of silt in each structure should be recorded to assess the rate of silt accumulation.

2. Chemical Testing

The following tests should be conducted to determine the performance of the constructed wetlands and sedimentation basins.

- Total Phosphorus (TP)
- Total Suspended Solids (TSS)

Many other parameters may be routinely measured in monitoring programs where ample funding and expertise are available. Most of these parameters are measured for reasons more academic than utilitarian. The 1988 EPA Lake and Reservoir Restoration Guidance Manual has a section on post monitoring of lake restoration projects. It is suitable for monitoring overall lake water quality improvement resulting from implementation of restoration practices. The guidance manual contains a table listing a sampling protocol for overall lake monitoring.

D. Monitoring Schedule And Sampling Locations

The monitoring should be performed on a seasonal basis with consideration given to interpreting the results of the chemical parameters. In different seasons, natural surface waters are expected to exhibit different chemical characteristics. This should be kept in mind when results are being analyzed. Therefore, results should not be compared between different seasons.

Visual inspection of the structural integrity of the project site should occur on a routine basis and as often as possible.

Growth of dominant vegetation should be well established by July. Therefore, the assessment of the vegetative community of the constructed wetlands should occur during this month.

Chemical samples should be taken at the inflow points to the constructed wetlands and sedimentation basins and the outlet of the downstream constructed wetlands. The samples should be taken from well mixed water at each location.

Table IV-1 presents the recommended annual monitoring schedule and the parameters to monitor.

TABLE IV-1 MONITORING SCHEDULE			
Monitoring Parameter	**Spring (April)**	**Summer (July)**	**Fall/Winter (Nov-Feb)**
Vegetation Mapping		X	
Structural Inspection	X	X	X
Total Phosphorus	X	X	X
Total Suspended Solids	X	X	X

The monitoring program should be implemented as soon as the constructed wetlands and sedimentation basins are filled to capacity and fully operational.

While the wetlands are expected to begin performing their intended purpose immediately, in-lake recycling of nutrients from main lake sediments will keep the phosphorus levels in the main lake water column high for several years to come.

E. Sample Collection And Analysis

Within 24 hours of the end of approximately a 1-1/2" rain event, samples should be collected at the locations discussed above. The laboratory chosen for the analytical chemistry will typically supply sample containers for the collection and storage of water samples.

Water can be analyzed for TP and TSS at relatively reasonable rates. For example TP samples analyzed to detection limits of 1/10 of a part per billion (0.1 ug/l) are usually performed for $28 per sample. TSS, measured in parts per million, can be analyzed at $14 per sample. Therefore, the annual cost for laboratory testing would be approximately $630, including sample shipping costs.

F. Reporting Format

The reporting of field measurements and observations should be done on standard forms (See **Appendix C**) made up by the person designated responsible for the monitoring and reporting of results. Care should be taken so that data from monitoring the constructed wetlands effectiveness can be used in a comparison to overall lake water quality postmonitoring results.

All field data sheets should be copied and stored in a 3-ring binder for annual compilation and analysis. Results of each monitoring should be tabulated so that comparisons between monitoring inspections are presented in only a few tables.

Results from the testing labs also need to be tabulated and included as part of the reporting format.

APPENDIX A

APPENDIX A

DAILY INSPECTION REPORT

Environmental Engineers/Biologists/Planners/Consultants
Walkerton/Indianapolis, Indiana

PG.___ OF ___

REPORT NO. ___

PROJECT NAME: _____

PROJECT NO. _____ DAY: _____ DATE: _____, _____
DAYS ALLOWED: ____ DAYS REMAINING: ____ TEMP; MAX: ___(F°), MIN: ____(F°)

WEATHER CONDITIONS: _____

CONTROLLING OPERATION: _____

WORK PERFORMED BY CONTRACTOR:

CONTRACTOR'S MANPOWER AT SITE:

CONTRACTOR'S EQUIPMENT AT SITE:

VISITORS TO SITE:

SIGNATURE: _____
Inspector

APPENDIX B

SEDIMENT BASIN SIZING

PROJECT NAME:	LOON LAKE
STRUCTURE:	SEDIMENT BASIN 1
FILENAME:	SEDBAS1.WK4

To calculate the initial volume needed for a rectangular sediment basin, enter the following information:

Sediment Yield to Basin:	2858	tpy
Sediment Density:	100	lb/cf
Annual Sediment Load:	1.31	ac-ft/yr
Needed Volume of Basin:	2.48	ac-ft
Trapping Efficiency of Basin:	45%	
Annual Sediment Entrapment:	0.59	ac-ft/yr
Annual Sediment Accumulation:	1285	tpy
No. of Years to Fill Basin 75%:	2.1	years

To calculate the dimensions of the rectangular sediment basin, enter the following information and match basin volume:

Width at Top of Basin:	100	ft
Length at Top of Basin:	150	ft
Slope Ratio:	2	w/d
Depth of Basin:	16	ft
Width at Bottom of Basin:	36	ft
Length at Bottom of Basin:	86	ft
Volume of 3/4 of Basin:	2.49	ac-ft

SEDIMENT BASIN SIZING

PROJECT NAME:	LOON LAKE
STRUCTURE:	SEDIMENT BASIN 2
FILE NAME:	SEDBAS2.WK4

To calculate the initial volume needed for a rectangular sediment basin, enter the following information:

Sediment Yield to Basin:	1000	tpy
Sediment Density:	100	lb/cf
Annual Sediment Load:	0.46	ac-ft/yr
Needed Volume of Basin:	1.38	ac-ft
Trapping Efficiency of Basin:	45%	
Annual Sediment Entrapment:	0.21	ac-ft/yr
Annual Sediment Accumulation:	457	tpy
No. of Years to Fill Basin 75%:	3.3	years

To calculate the dimensions of the rectangular sediment basin, enter the following information and match basin volume:

Width at Top of Basin:	90	ft
Length at Top of Basin:	100	ft
Slope Ratio:	2	w/d
Depth of Basin:	16	ft
Width at Bottom of Basin:	26	ft
Length at Bottom of Basin:	36	ft
Volume of 3/4 of Basin:	1.37	ac-ft

APPENDIX C

APPENDIX C

CONSTRUCTED WETLANDS MONITORING FORM

FRISKNEY DITCH

Volunteer's Name:_____

Site:_____

Date:_____

Time:_____

Air Temp:_____

Weather: ___Sunny ___Partly Cloudy ___Overcast ___Rain

Wind: ___0-5 mph ___5-10 mph ___10-15 mph ___15+ mph

Wind Direction:_____

Structural Integrity

Evidence of Human Activity:_____
_____
_____

Evidence of Erosion:_____
_____
_____

Assessment of Vegetation

Wetland Plants:	Type	Number
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____

Herbaceous Cover:	Type	Number

Shrubs:	Type	Number

Trees:	Type	Number

Depth of Silt

Sedimentation Basin No. 1:_____

Sedimentation Basin No. 2:_____

Chemical Testing (To be filled in after receipt of test results)

Total Phosphorus (TP):_____

Total Suspended Solids (TSS):_____